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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/612,033

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Tadashi Iguchi

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EXAMINER

QUINTO, KEVIN V

ART UNIT

PAPER NUMBER

2826

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/612,033	<b>Applicant(s)</b> IGUCHI ET AL.	
	<b>Examiner</b> Kevin Quinto	<b>Art Unit</b> 2826	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 September 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 4,5,7-11,14-16,18,19,21 and 22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 5,15 and 22 is/are allowed.
- 6) ☒ Claim(s) 4,7-11,14,16,18,19 and 21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                    | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments with respect to claims 4, 7-11, 14, 16, 18, 19, and 21 have been considered but are moot in view of the new ground(s) of rejection.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 4, 7, 8, 10, 11, 14, 16, 18, 19, and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Aritome (USPN 5,949,101).

4. In reference to claim 4, Aritome (USPN 5,949,101) discloses a similar device. Figures 30, 35, and 36 of Aritome each discloses a non-volatile semiconductor memory device with memory cells arranged in a matrix on a semiconductor substrate. Each cell in the matrix has a floating gate or electrode (30). A plurality of first trenches are formed in the semiconductor substrate with each first trench being formed between the memory cells adjacent each other along a gate width direction. The plurality of first trenches is filled with an isolating filler. There is a plurality of second trenches, each of which is in the shape of an inverted trapezoid, formed in the isolating filler between the floating gates (30) of the memory cells adjacent to each other along the gate width direction. A

Art Unit: 2826

word line (29), buried in the second trenches, is connected to the memory cells and extends along the gate width direction.

5. In reference to claim 7, there is a gate insulating film in the second trenches with the word line (29) being on the gate insulating film.

6. With regard to claim 8, Aritome discloses that the gate insulating film may be made of silicon nitride (claims 11 and 16 in column 16).

7. In reference to claim 10, the second trench is shallower than the first trench and extends below a surface of the semiconductor substrate.

8. With regard to claim 11, Aritome makes it clear that the devices can be a NAND-type or a NOR-type electrically erasable programmable read only memory.

9. In reference to claim 18, figure 6 of Aritome shows that there is a second gate insulating film on the inner surface of each of the second trenches.

10. With regard to claim 21, the applicant has characterized a second trench which is capable of reducing parasitic capacitance as being shallower than the first trench and preferably reaches at least the surface of the well region (currently filed specification, p. 9, lines 16-21). The second trench of Aritome meets these characteristics thus meeting the claim. Furthermore, the applicant has characterized a second trench as reducing parasitic capacitance since the parasitic capacitance generated by the floating gate, the dielectric in the trench, and an insulating film of the trench, and at the word line is electrically connected in parallel to the parasitic capacitance between floating gates of the memory cells (currently filed specification, p. 3, lines 6-16). The second trench of Aritome also meets these characteristics as well and thereby meets the claim.

Art Unit: 2826

11. In reference to claim 14, Aritome (USPN 5,949,101) discloses a similar process. Figures 30, 35, and 36 of Aritome each discloses a method of manufacturing a semiconductor memory which comprises making element isolating regions by forming a plurality of first trenches in a semiconductor substrate. Each first trench is made between adjacent ones of memory cell forming regions along a gate width direction. The plurality of first trenches is filled with a plurality of isolating fillers. A plurality of floating gate electrodes (30) are formed on the semiconductor substrate at the memory cell forming regions. The floating gate electrodes (30) have a predetermined gate width. A plurality of second trenches, each of which is in the shape of an inverted trapezoid, is formed in the isolating fillers filled in the first trenches. Each second trench is made between adjacent ones of the floating electrodes (30) along the gate width direction. A word line (29) is formed in the second trenches. The wordline (29) is connected to the memory cells and extends along the gate width direction.
12. With regard to claim 16, the second trenches are in self-alignment with the floating electrodes (30).
13. In reference to claim 19, figure 6 of Aritome shows that there is a second gate insulating film on the inner surface of each of the second trenches.

### ***Claim Rejections - 35 USC § 103***

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

Art Unit: 2826

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Aritome (USPN 5,949,101).

16. In reference to claim 9, Aritome does not disclose the exact ratios of the first and second trenches as that claimed by the applicant. However:

"[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Thus claim 9 is not patentable over Aritome.

### ***Allowable Subject Matter***

17. Claims 5, 15, and 22 were allowed in a previous Office action.

18. The following is an examiner's statement of reasons for allowance: the reasons for the allowance of claims 5, 15, and 22 were cited in a previous Office action.

19. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Quinto whose telephone number is (571) 272-1920. The examiner can normally be reached on M-F 8AM-5PM.

Art Unit: 2826

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on (571) 272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kevin Quinto/  
Examiner, Art Unit 2826

/Sue A. Purvis/  
Supervisory Patent Examiner, Art Unit 2826